Clean Distributed Generation Workshop Notes
Local Siting, Permitting and Code Issues
New York, August 13-14, 2001
(Notes on presentations are the same for both days.)

Welcoming Remarks: Gerri Whitehead, Director Key Account Sales, KeySpan and (on August 14) Dan Zaweski, Manager of Energy Efficiency and Distributed Energy Services for the Long Island Power Authority

Overview of Agenda: Tom Bourgeois, Pace Energy Project

Overview of New York State Activities to Promote Distributed Generation: Nag Patibandla, New York State Energy Research & Development Authority
"Strategic Approach to Promoting Distributed Generation and Combined Heat and Power"

- NYSERDA definitions and applications for DG: premium power, backup/standby power, peak shaving, baseload/CHP
- Premium power is the most expensive, then backup/standby power, peak shaving, and baseload/CHP are least expensive
- CHP makes sense – capacity is constrained, electricity demands are high, thermal demands are high, extended operating hours, access to fuels
- Hurdles – success is linked with the customer's ability to establish bi-directional grid interconnection
  - Interconnection issues – electrical, communication, fuel interfaces
  - Technical issues – grid stability, safety, reliability, power quality
  - Business issues – exit fees, standby/backup charges, financial
  - Siting and permitting issues – (local, regional, state) lack of uniform procedures/standards
  - Lack of operating data on power quality, availability, emissions, reliability
- Industrial applications represent 77% of existing CHP in New York in 1999, which was 4,600 MW at 200 sites. (90% of the MW were installed at 32 sites.)
  - Primarily gas turbine based and natural gas fueled
  - Remaining CHP potential: 11,300 MW
- NYSERDA strategy
  - Studies and roadmapping for further program development
  - Feasibility analysis to evaluate project potential and viability
  - Develop and demonstrate enabling technologies
  - Product development, testing, evaluation
  - Demonstration of projects to operate and evaluate new technologies and applications. Right now doing this with a superconductivity project.
  - Supports 20 projects demonstrating viability in industrial, institutional, commercial, and residential applications
  - In 2001 installed capacity is expected to reach 7 MW
- CHP funding – about 35-37 MW – awards amount to $20 million – will announce grant in September and it will close in December

Clean Distributed Generation Overview: Anne-Marie Borbely, Advisor to U.S. DOE

- Issues with deployment include contracts, grid connection, permitting
- Next year outreach program will focus on public education and training for DG codes and standards
- Advocacy, adoption and training is a 7-10 year process – to get regional building codes adopted, for local authorities to adopt them, and then to train and educate the officials and create a state-by-state certification
- DOE supports the IEEE P1547 Interconnection Standard, UL and CSA performance standards
- Nevada test site working with communications and controls for large scale testing of DG interconnection devices with third party aggregator or demand/supply exchange with ISO
- DOE is looking forward to being involved in the exchange and conversation regarding what is needed to deploy DG in New York

MicroTurbine Technology Overview and Issues: Rebecca Rice and Bryan Fox, Capstone Turbine Corp.

(These notes supplement the handouts for the presentation.)

Rebecca Rice (Sales):

- Capstone can multipack up to 20 units right now, and this will increase
- They can be configured for grid interconnection, stand-alone and dual mode applications
- The technology is approaching zero emissions at a fraction of the cost
- Current installations: waste water treatment plant in Pennsylvania, Puente Hills landfill in California, plastics manufacturing plant in upstate New York (25 microturbines/CHP)
- Further development is taking place with flex turbine, advanced microturbine, BCHP (DOE-sponsored)
- Manufacturing capacity is at level to make 20,000 microturbines per year
- Cost: 30kW for $29,000-36,000 and 60kW for about $55,000 (unit-only costs)
- 40,000 operating hours before first overhaul needed
- 8,000 operating hours before maintenance needed
- Simple cycle efficiency is below 20% (no recuperator)
- 20% efficiency with recuperator and internal fuel compressor
- 70-90% efficiency with CHP applications

Brian Fox (Certification Engineer):

- Can dial into the microturbine from a modem and control from anywhere
- Foil bearing compressor can go down to ½ psi
- Exhaust is around 500 degrees for a 30kW unit, and 600-700 degrees for a 60kW unit
- 750-1600hz; 96,000 rpm maximum; idle speed 45,000 rpm
- Dual mode installation can handle up to a 10 pack, and Capstone is working on dual mode installations that can handle up to a 100 multi-pack unit
- A 30kW unit runs ideally at 59 degrees (ISO conditions), as temperature increases, generation decreases (for example at 100 degrees, the microturbine would generate about 23kW)

- Installation issues:
  - Mounting – building, roof, outside, etc.
  - Public access – who do you want to have access to the unit?
  - Service access – have to leave room to move unit for servicing
  - Fuel supply – gas pressure
  - Power wiring – cable length
  - Control wiring – communications cable length
  - Intake and exhaust air – is air adequate?
  - Exhaust heat – concerned about high exhaust heat?
  - Regulatory requirements – is UL required? Building and fire codes
    - Installation codes – NFPA 37 (engines), NFPA 54 (fuel gas), NFPA 70 (electric), NFPA 99 (health care facilities), NFPA 110 (emergency and standby)
    - Jurisdictional requirements can include city, county, state and federal codes that all have to be met
    - Before purchasing units, need to be aware of all applicable codes
- Capstone is only microturbine that is UL listed (30kW unit – 60 kW grid-connected unit should be listed within the next couple days, and stand-alone unit within a couple months)
- In April 2000 Capstone model 330 was UL certified – complied with New York State interconnection standards
- In May 2001 the model 330 complied with UL 1741, basis for the soon-to-be IEEE P1547
- Capstone sells units with or without the enclosure (shell) so customers may more easily meet their sizing requirements
- **Discussion following presentation:** municipal codes usually supercede national codes, but may reference them; in New York, they are trying to update the codes, should be done within the next year; most diagrams are borrowed from the International FGC for new codes that are coming up at the beginning of next year; UL 1741 is more strict than IEEE 1547, and once adopted DOE will conduct workshops around the country to help states adopt it

Fuel Cell Technology Overview & Issues: Ken Krastins, Plug Power, Inc.
(These notes supplement the handouts for the presentation.)

- PEM fuel cell has the lowest operating temperature at 50 degrees C, and runs at 30-30% electrical efficiency
- Product requirements: codes and standards
  - ANSI Z21.83 – overall fuel cell system with less than 1 MW of output
  - UL 1741 – safety for inverters, converters, controllers – use in independent power systems
  - UL does not have a fuel cell-specific code
  - NFPA 853 (standard for installation of fuel cells), NFPA 54 (national fuel gas code), NFPA 70 (national electric code)
- Interconnection
  - New York standardized interconnection requirements for DG that is less than 300kW on a radial feed
  - IEEE 929 – recommended practice for utility interface of PV less than 10kW, which can be applied to fuel cell installations

  - Requirements under development – ASME Performance Test Code 50 for fuel cells; NFPA 70-2002, Article 692 for fuel cells; IEEE 1547; IEC TC105 International Fuel Cell Standard
- Fuel cells up to 5 kW are mostly for residential applications
- GE is sole distributor (GE Microgen) of Plug Power fuel cells
- Approximate price $40,000
- Maintenance target – have stack replaced every five years
- At the end of next year, the product should be commercially available – current unit is not at that stage yet

ARES Advanced Natural Gas Recip Technology Overview: Gordon Gerber, Caterpillar, Inc. (These notes supplement the handouts for the presentation.)
- Units excel in the 5 to 6 MW range
- DG range is 0 to 10 MW
- 38-40% BTE, 2g NOx
- With heat recovery, around 90% efficient
- ARICE – CEC approach on recips – RFP should be published next month
- Caterpillar holds 60% of New York market, and 63 GW (106,000 units) are installed in the US

Case Studies of New York Clean Distributed Generation Installations, with Local Code Issues Highlighted: Pete Grzybowski, KeySpan
- St. Vincent Medical Center, Staten Island
  - International Fuel Cells PC-25A, 200 kW
  - Commissioned 1992
  - Has more than 47,000 operating hours
  - High efficiency – 40.42%, thermal 55% efficient
  - Interconnection with ConEd
- St. James Health Care Facility, St. James, Long Island
  - CHP unit
  - Commissioned in June, 2000
  - 60kW in parallel with local utility
  - 91% efficient
  - Quiet – about as loud as an air conditioner
  - Thermal output preheats boiler feed water
  - Took more than one year to permit – local town officials were not familiar, went through a zoning board appeals review – issues were noise, unfamiliarity, residential zoning with commercial enterprise, fence, footprint, aesthetics
- Atlantis Marine World
  - Capstone 30 kW microturbine with heat recovery unit
  - First installation of its kind in the Long Island area
  - Runs in parallel with local utility
  - Unfinished heat recovery
  - High frequency DC machines

  - Less than 9 ppm of NOx
  - Local town acceptance
  - KeySpan R&D project
  - Commissioned January 2001
  - 3,000 operating hours right now
  - Local utility delayed interconnection approval
  - Case that got LIPA to accept state standards
  - Local regulators wanted lots of insurance
  - Approval took 6 months, but the same process now takes about 6 weeks
- Brooklyn Methodist Church Home
  - Coast Intelligen 65kW CHP
  - Commissioned May 2001
  - Running parallel to local grid
  - 90% efficiency
  - Professional award winning installation
  - Local utility (ConEd) took 6 moths to review and approve simple induction interconnection
- Sun Chemical Industries, Staten Island
  - 400kW fuel cell
  - First International Fuel Cells (two ONSIPC 25-C) in North America
  - 80% efficiency
  - Quiet – makes about as much noise as a dishwasher
- Keys to problem-free DG installation
  - Hire contractor that is aware of all rules, regulations, codes and standards
  - Get acceptance from all licensing entities
  - Maintain good communication with all parties
- Why DG is important now
  - Supply and demand is skyrocketing rates
  - Power quality and quantity issues
  - Low voltage situations
  - Incentives and funding available through NYSERDA, NYC ECSP, ICIP, EDGAR, DOE

Structured Discussion on Local Siting, Code and Permitting Issues
August 13, 2001
Moderator: Adam Hinge, Pace Energy Project Consultant

(Discussion includes issues within all five boroughs of New York City)

Permitting and Siting Issues

- State:
  - Exempt status
  - Need permit for continuous generation units
  - If over 150kW need permit (5 months or more/25 ton NOx rule)
- City:
  - Registration for application of exemption

Potential for Streamlined Process

- Blanket for fuel cells by specific reference
- Trend toward full backup power
- Ambiguity in DEC renewable energy interconnection – rules have been changing, marketplace and technologies are changing, and regulations are trying to keep up

Applicable Code Requirements

- Fire protection devices – emergency generators
- Strength of floor
- Capability to handle high temperatures from exhaust gas and gas pressure (anything above ½ pound)
- Gas connection requires plumbing requirements
- Material and equipment acceptance (MEA)
- Emergency, backup, etc. generators all fall under the rules
- Bureau of Electrical Control – Advisory Board Submission for over 1,000kVa/480 volts
- File with local utility
- Outdoor mechanical equipment within 100 feet of residence requires a noise test and buffer noise

Code Barriers

- Venting – must get various permits including from neighboring building, as it affects within 100 feet, and exhaust must be 4 feet above roof
- 300kVa interconnection is only for radial system, which is a small percent of the New York system
- Fuel storage – restrictions on how much can be stored above first floor – 275 gallons per floor
- Boiler/chiller in building over certain amounts requires stationary engineer, depends on refrigerant, if water used does not require engineer
- State and air regulators give different answers to the same questions on an application – room for interpretation
- Vibration controls

Action Items:
Draft outline of the issues and try to create a guidebook with DOE and NYSERDA to synthesize, streamline process and to identify outreach opportunities. It will take approximately 6-12 months to move through this process.

Structured Discussion on Local Siting, Code and Permitting Issues
August 14, 2001
Moderator: Adam Hinge, Pace Energy Project Consultant

Permitting and Siting Issues
- Emissions
- Aesthetics, buffering, security, preventative actions
- Noise – zoning department
- Set-back requirements
- Renewing air permits
- Debunking myths
- DEC application list/permit – need to spell-out certain requirements for standby/backup DG
- Traffic issues (fuel deliveries, moving in and out of plant, etc.)

Ideas for Outreach
- NYSBOC has an annual meeting
- NY Association of Towns also meets frequently

Applicable Code Requirements
- New York State adopting international code
- Hydrogen safety – does not seem to be as big an issue as propane